WRITTEN AMENDMENTS
(Amended under the provision of Article 11)

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1. Display of International Application
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4. Sections to be Amended
Claims

5. Content of Amendments
(1) As in the appended pages, claims 1, 3, 6, 8, 13, 15, 31, 33 and 34 are deleted.

(2) As in the appended pages, "; and wherein the grooves are formed ... and depth 4d." in claim 2 is amended to "; wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d; and wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d."

(3) As in the appended pages "; and wherein the photodetecting means ... recording media." in claims 7, 14 and 32 is amended to "; wherein the photodetecting means detects light that is at least either reflected or diffracted by the information recording media; and wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d."

(4) As in the appended pages "according to claim 1 or 2" in claims 4 and 5 is amended to "according to claim 1".

(5) As in the appended pages "according to claim 6 or 7" in claims 9 to 12 is amended to "according to claim 6".

(6) As in the appended pages "according to claim 13 or 14" in claims 16 to 27 is amended to "according to claim 13".

(7) As in the appended pages "according to claim 6, 7, 13 or 14" in claims 28 to 30 is amended to "according to claim 7 or 14".

(8) As in the appended pages "according to claim 6, 7, 13, 14," in claims 48 to 52 is amended to "according to claim 7, 14,".

6. List of Appended Documents
Pages 103 to 114, 121 and 122 of the claims are new[1].

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[1] Translators note. These correspond to pages 100 to 113 and 119 of the English translation

CLAIMS

1.(deleted)

2.(amended) An optical element, comprising:

a substrate in which grooves are formed;

wherein the expression:

$380 \text{ nm} \leq (n - 1) \times d \leq 420 \text{ nm}$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth of one step of the grooves;

wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d; and

wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d.

3.(deleted)

4.(amended) The optical element according to claim 2;

wherein the grooves are formed in concentric ring-shapes.

5.(amended) The optical element according to claim 2;

wherein the grooves are adjacent via a portion in which no grooves are formed, and the width of each step of the grooves, is substantially the same as the width of the portion in which no grooves are formed.

6.(deleted)

7.(amended) An optical head, comprising:

a first light source that emits light of a first wavelength, that at least either records onto or reproduces information from a first information recording medium;

a second light source that emits light of a second wavelength, that at least either records onto or reproduces information from a second information recording medium;

focusing means for focusing light that is emitted from the first light source or from the second light source;

an optical element that passes light of the first wavelength and diffracts light of the second wavelength; and

photodetecting means for detecting light of the first wavelength and light of the second wavelength;

wherein light of the first wavelength and light of the second wavelength pass through the optical element, after which they are focused by the focusing means and are emitted onto the information recording media;

wherein the optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$$380 \text{ nm} \leq (n - 1) \times d \leq 420 \text{ nm}$$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth of one step of the grooves;

wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d;

wherein the photodetecting means detects light that is at least either reflected or diffracted by the information recording media;

and wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d.

8.(deleted)

9.(amended) The optical head according to claim 7,

wherein the second wavelength is from 1.5 to 1.8 times the length of the first wavelength.

10.(amended) The optical head according to claim 7,

wherein the grooves of the optical element are formed on a face that is close to the focusing means.

11.(amended) The optical head according to claim 7,

wherein for light of the second wavelength that is diffracted by the optical element, the light that diverges with respect to incident light is stronger than the light that converges with respect to incident light.

12.(amended) The optical head according to claim 7,

wherein the optical element corrects the aberration to not more than 70 mλ when light of the second wavelength that is diffracted by the optical element is focused on an information surface of a second information recording medium.

13.(deleted)

14.(amended) An optical head, comprising:

a first light source that emits light of a first wavelength, that at least either records onto or reproduces information from a first information recording medium;

a second light source that emits light of a second wavelength, that at least either records onto or reproduces information from a second information recording medium;

a third light source that emits light of a third wavelength, that at least either records onto or reproduces information from a third information recording medium;

focusing means for focusing light that is emitted from the first light source, from the second light source and from the third light source;

a first optical element that passes light of the first wavelength and diffracts light of the second wavelength and the third wavelength; and

photodetecting means for detecting light of the first wavelength, light of the second wavelength and light of the third wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the optical element, after which they are focused by the focusing means and are irradiated onto the information recording media;

wherein the first optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$$380 \text{ nm} \leq (n - 1) \times d \leq 420 \text{ nm}$$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth of one step of the grooves;

wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d;

wherein the photodetecting means detects light that is at least either reflected or diffracted by the information recording media; and

wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d.

15.(deleted)

16.(amended) The optical head according to claim 14,

wherein the second wavelength is from 1.5 to 1.8 times the length of the first wavelength; and

wherein the third wavelength is from 1.8 to 2.2 times the length of the first wavelength.

17.(amended) The optical head according to claim 14,

wherein, when a first region is a substantially circle-shaped region in the central vicinity of the first optical element, a second region is a substantially ring-shaped region that surrounds the first region, and a third region is a region on the outside of the second region,

light of the first wavelength passes through the first, second and third region, light of the second wavelength passes through the first and second region, and light of the third wavelength passes through the first region.

18.(amended) The optical head according to claim 14,

wherein for light of the second wavelength and third wavelength that are diffracted by the first optical element, the light that diverges is stronger than the light that converges with respect to incident light.

19.(amended) The optical head according to claim or 14, further comprising:

phase correcting means for correcting the aberration of light of the second wavelength that is diffracted by the first optical element to not more than 70 mλ when light of the second wavelength is focused on the information surface of the second information recording medium, and

for correcting the aberration of light of the third wavelength that is diffracted by the first optical element to not more than 70 mλ when light of the third wavelength is focused on the information surface of the third information recording medium;

wherein the phase correcting means does not change the phase of light of the first wavelength; and

wherein the phase correcting means is provided in the light path between the light sources and the optical information recording medium.

20.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and

irradiated onto the optical information recording medium.

21.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium;

wherein the second optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$760 \text{ nm} \leq (n - 1) \times d \leq 840 \text{ nm}$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth per step of the grooves; and

wherein the grooves are formed in two steps of depth d and depth 2d.

22.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium;

wherein the second optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$760 \text{ nm} \leq (n - 1) \times d \leq 840 \text{ nm}$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth per step of the grooves; and

wherein the grooves are formed in three steps of depth d, depth 2d and depth 3d.

23.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium; and

wherein the first optical element and the second optical element are formed on a top and a rear of a single substrate.

24.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium; and

wherein the first optical element and the second optical element are formed on a top and a rear of a single substrate, and the face on which the second optical element is formed, of the two faces of the single substrate, is closer to the focusing means.

25.(amended) The optical head according to claim 14, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium; and

wherein the first and second optical elements correct the aberration of light of the second wavelength that is diffracted by the first and second optical elements to not more than 70 mλ when that light is focused onto the information surface of the second information recording medium; and

correct the aberration of light of the wavelength λ3 that is

diffracted by the first optical element to not more than 70 mλ when that light is focused on the information surface of the third information recording medium.

26.(amended) The optical head according to claim 14,

wherein, when a distance between the surface of the first information recording medium on the focusing means side, and the tip of the focusing means on the side of the first information recording medium is WD1 when light of the first wavelength is irradiated onto the first information recording medium, and

a distance between the surface of the second information recording medium on the focusing means side, and the tip of the focusing means on the side of the second information recording medium is WD2 when light of the second wavelength is irradiated onto the second information recording medium, and

a distance between the surface of the third information recording medium on the focusing means side, and the tip of the focusing means on the side of the third information recording medium is WD3 when light of the third wavelength is irradiated onto the third information recording medium,

a difference between the maximum value and the minimum value of WD1, WD2 and WD3 is smaller than the maximum value of the diameter of the focusing means.

27.(amended) The optical head according to claim 14,

wherein, when a distance between the surface of the first information recording medium on the focusing means side, and the tip of the focusing means on the side of the first information recording medium is WD1 when light of the first wavelength is irradiated onto the first information recording medium, and

a distance between the surface of the second information recording medium on the focusing means side, and the tip of the focusing means on the side of the second information recording medium is WD2 when light of the second wavelength is irradiated onto the second information recording medium, and

a distance between the surface of the third information recording medium on the focusing means side, and the tip of the focusing means on

the side of the third information recording medium is WD3 when light of the third wavelength is irradiated onto the third information recording medium,

WD1, WD2 and WD3 are substantially equivalent.

28.(amended) The optical head according to claim 7 or 14, further comprising:

a converter for converting a plurality of signals, which are received in parallel, and are output from the photodetecting means into a serial signal.

29.(amended) The optical head according to claim 7 or 14, further comprising:

a converter for converting a plurality of signals, which are received in parallel, and are output from the photodetecting means, into a serial signal;

wherein the serial signal is an electrical signal.

30.(amended) The optical head according to claim 7 or 14, further comprising:

first converter for converting a plurality of signals, which are output from the photodetecting means and received in parallel, into a serial signal; and

second converter means for receiving the electric signal that is output from the first converter means and for converting the electric signal into an optical signal.

31.(deleted)

32.(amended) An optical information recording and reproduction apparatus, comprising:

an optical head that includes;

a first light source that emits light of a first wavelength, that at least either records onto or reproduces information from a first information recording medium;

a second light source that emits light of a second wavelength, that at least either records onto or reproduces information from a second information recording medium;

focusing means for focusing light that is emitted from the first light source or from the second light source;

an optical element that passes light of the first wavelength and diffracts light of the second wavelength; and

photodetecting means for detecting light of the first wavelength and light of the second wavelength,

further comprising:

moving means for moving the information recording medium and the optical head relative to each other;

wherein light of the first wavelength and light of the second wavelength pass through the optical element, after which they are focused by the focusing means and are irradiated onto the information recording media;

wherein the optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$$380 \text{ nm} \leq (n - 1) \times d \leq 420 \text{ nm}$$

is satisfied where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth of one step of the grooves;

wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d;

wherein the photodetecting means detects light that is at least either reflected or diffracted by the information recording media; and

wherein the depth of the grooves is lined up in the order: depth 2d, depth 4d, depth d, depth 3d, or in the order: depth 3d, depth d, depth 4d, depth 2d.

33.(deleted)

34.(deleted)

35. An optical information recording and reproduction apparatus, comprising:

an optical head that includes;

a first light source that emits light of a first wavelength, that at least either records onto or reproduces information from a first information recording medium;

a second light source that emits light of a second wavelength, that at least either records onto or reproduces information from a second information recording medium;

a third light source that emits light of a third wavelength, that at least either records onto or reproduces information from a third information recording medium;

focusing means for focusing light that is emitted from the first light source, from the second light source and from the third light source;

a first optical element that passes light of the first wavelength and diffracts light of the second wavelength and light of the third wavelength; and

photodetecting means for detecting light of the first wavelength, light of the second wavelength, and light of the third wavelength;

further comprising:

moving means for moving the information recording medium and the optical head relative to each other;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the optical element, after which they are focused by the focusing means and are irradiated onto the information recording media;

wherein the first optical element is an optical element in which grooves are formed in a substrate;

wherein the expression:

$$380 \text{ nm} \leq (n - 1) \times d \leq 420 \text{ nm}$$

is satisfied, where n is a refractive index of the substrate at a wavelength of 400 nm, and d (nm) is a depth per step of the grooves;

wherein the grooves are formed in four steps of depth d, depth 2d, depth 3d and depth 4d; and

wherein the photodetecting means detects light that is at least either reflected or diffracted by the information recording media.

36. The optical information recording and reproduction apparatus according to claim 34 and 35, further comprising:

a second optical element that passes light of the first wavelength and light of the third wavelength, and diffracts light of the second wavelength;

wherein light of the first wavelength, light of the second wavelength and light of the third wavelength pass through the two optical elements, after which they are focused by the focusing means, and irradiated onto the optical information recording medium.

37. An optical element, comprising:

47. An optical information recording and reproduction apparatus, comprising:

an optical head according to claim 39, 40, 41, 43, 45 or 46; and

moving means for moving the information recording media and the optical head relative to each other.

48.(amended) A computer, comprising:

an optical information recording and reproduction apparatus that includes an optical head according to claim 7, 14, 39, 40, 41, 43, 45 or 46,

as an external storage device.

49.(amended) An image recording device, comprising:

an optical information recording and reproduction apparatus that includes an optical head according to claim 7, 14, 39, 40, 41, 43, 45 or 46;

which can at least record images from among recording images onto and reproducing images from an information recording medium.

50.(amended) An image reproduction device, comprising:

an optical information recording and reproduction apparatus that includes an optical head according to claim 7, 14, 39, 40, 41, 43, 45 or 46;

wherein it spcializes in reproducing images from an information recording medium.

51.(amended) A server, comprising:

an optical information recording and reproduction apparatus that includes an optical head according to claim 7, 14, 39, 40, 41, 43, 45 or 46, as an external storage device.

52.(amended) A car navigation system, comprising:

an optical information recording and reproduction apparatus that includes an optical head according to claim 7, 14, 39, 40, 41, 43, 45 or 46, as an external storage device.